

Multiplying and Dividing Fractions:

A Conceptual Approach

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Why Teach Conceptually?

- Mathematical Practices for CCSS
 - #1-Perseverance in solving problems
 - #3-Critique the reasoning of others
 - #4-Model with mathematics
 - #5-Use tools strategically
- CCSS Number and Operations-Fractions
 - 5.NF4- "apply previous understandings"
 - 5.NF5b- "explain why"
 - 5.NF7a- "create a story context"

MULTIPLICATION

- Previous Understandings
 - > $3 \times 4 =$ three groups of four
 - Visual model:



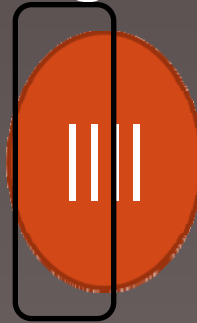
- > $1 \times 4 =$ one group of four
 - Visual model:



MULTIPLICATION

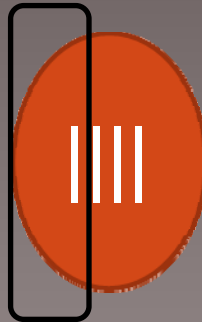
> $\frac{1}{2} \times 4 =$ half of a group of four

- Visual model:



> $\frac{1}{4} \times 4 =$ one fourth of a group of four

- Visual model:



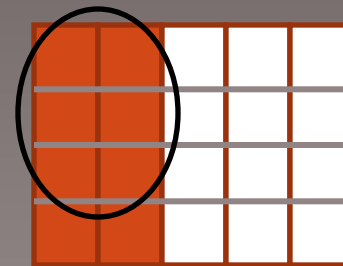
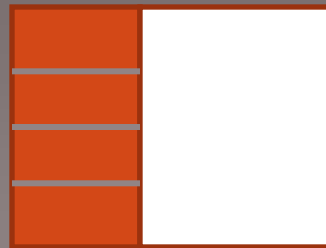
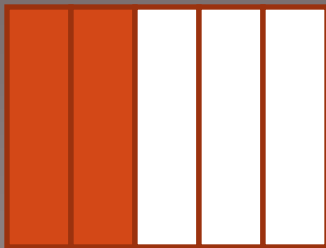
MULTIPLICATION

- Story Context for $\frac{1}{3} \times \frac{2}{3}$
 - > There was $\frac{2}{3}$ of a pizza left over in the fridge. For lunch, Joe ate $\frac{1}{3}$ of the left over pizza. How much of the whole pizza did Joe eat for lunch?
 - > Visual model:



MULTIPLICATION

- Story Context for $\frac{3}{4} \times \frac{2}{5}$
 - > Kate had $\frac{2}{5}$ of her book left to read. On Wednesday night, she read $\frac{3}{4}$ of that. How much of the whole book did Kate read Wednesday night?
 - > Visual model:



Multiplication

- Student created word problems:
 - $\frac{3}{4} \times \frac{2}{5}$ - Abel shaved $\frac{2}{5}$ of his head. He got a Chewbaca tattoo on $\frac{3}{4}$ of the shaved area. How much of Abel's head is tattooed with Chewbaca?
 - $\frac{5}{6} \times \frac{4}{5}$ - $\frac{4}{5}$ of Squidward's body is tentacles. If $\frac{5}{6}$ of his tentacles were made into Calamari, how much of Squidward can be eaten for dinner?

MULTIPLICATION

> Try It:

- $\frac{3}{5} \times \frac{2}{6}$

1. Create a story context.

2. Draw a visual model.

Division

- Previous Understandings

- > Partitive Division "Group Size Unknown"

- $12 \div 3 = 4$



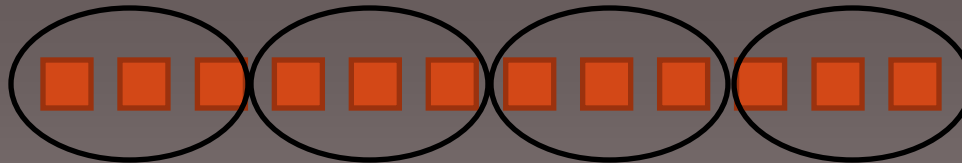
- Key = What will one group get?

Division

- Previous Understandings

- > Measurement Division “Number Of Groups Unknown”

- $12 \div 3 = 4$



- Key = How many groups can be made?

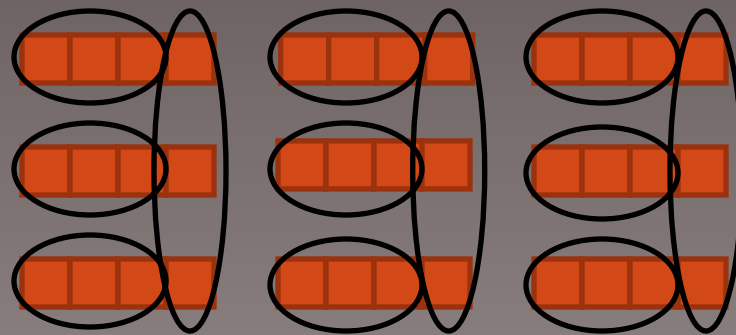
Division

- Story Context for $9 \div \frac{3}{4}$ - Partitive
- It took Sarah 9 hours to finish $\frac{3}{4}$ of her homework. How long will it take Sarah to do her entire homework at this rate?
- > Visual model:



Division

- Story Context for $9 \div \frac{3}{4}$ - Measurement
- Steve had 9 candy bars. A recipe for smores calls for $\frac{3}{4}$ of a candy bar. How many smores can he make?
 - > Visual model:



Division

- Student created word problems:
 - > It took Emilia 7 hours to paint $\frac{2}{3}$ of her room. How long will it take Emilia to paint her entire room?
 - > It took Julian 6 seconds to drink $\frac{4}{5}$ of a soda bottle. How long will it take Julian to finish the whole bottle?

Division

> Try It:

- $4 \div 2/5$

1. Create a story context.

- Partitive
- Measurement

2. Draw a visual model.

- Partitive
- Measurement

Multiplication and Division

- Student samples show that students switched between the algorithmic procedures and visual models.
- Students explained that when they were unable to identify the operation needed that the visual model helped.
- Students also used the visual model to check their answers for reasonableness.